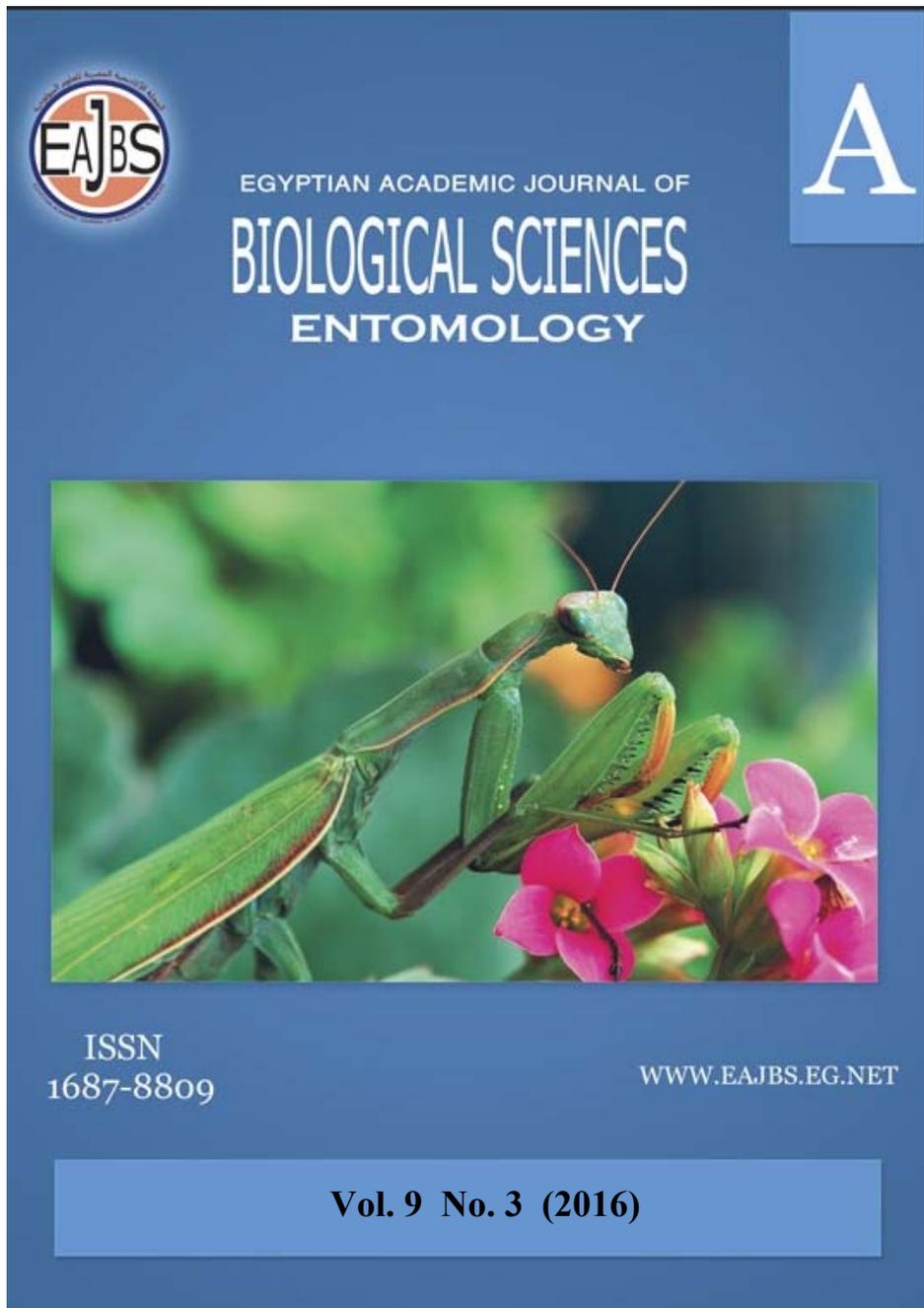


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**Susceptibility of Six Wheat Varieties to Infestation with the Khapra beetle,  
*Trogoderma granarium* (Coleoptera : Dermestidae)**

**Naima Abd El Raouf Abd El razik<sup>1</sup>, Mohamed Adel Hussein Tawfik<sup>1</sup>, Sanaa  
Mahmoud Mahgoub<sup>2</sup> and Doaa Mahmoud Gharib<sup>2</sup>**

1- Entomology Department, Faculty of Science, Ain Shams University.

2- Stored Grain Pests Research Department, Plant Protection Research Institute,  
Agricultural Research Center.

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**ABSTRACT**

Spiders are among the most abundant predators recorded on date palm trees in Beni-Suif and Qaluobia Governorates. They are voracious predators, and combined with their high abundance, which play an important role in the reduction of different pests' populations. Field trials were conducted in Qaluobia and Beni-Suif Governorates during the period of October 2013 to October 2014 to show the incidence of different spiders. Obtained data recorded that the collected predaceous spiders were identified into 14 families in Beni-Suif included 11 families recorded in Qaluobia as follows; Theridiidae, Philodromidae, Thomisidae, Lycosidae, Linyphiidae, Gnaphosidae, Dictynidae, Miturgidae, Araneidae, Tetragnathidae, Agelemidae, Scytodidae, Filistidae and Uloboridae. Also a ratios of these count, indicated that an average of 25 % of spider families and species were absent from palm in Beni-Suif Governorate. On the other hand, under these families recorded 19 species of predator. The most numerous spiders species collected from date palm phoenix *dactylifera* at Beni-Suif Governorate were 227 individuals of *Steatoda pykuliana*, while the high number of predators species collected from Qaluobia Governorate were 223 individuals of *Filistata hibernalis*.

**INTRODUCTION**

The true spiders are one of the most important biological control agents against different pests infesting different crops. El-Erksousy *et al.*, 2006; Huseynov, 2007; Turnbull, 1973; Johnson *et al.*, 2000; Whitehouse and Lawrence 2001 recorded the true spider's agent against certain agricultural pests. All adult spiders are predaceous, which play an important role in the reduction of pest pulsations (Greenstone 1999 and Riechert 1999). However, individual spider species lack many of the characteristics suggested as necessary for a successful biological-control agents (Murdoch *et al.*, 1985).

They feed on a variety of prey and do not exhibit density-dependent tracking of prey populations. Nonetheless, spider assemblages as a whole impose high levels of mortality on pest populations in various crops (Riechert & Bishop 1990; Casrte and Rypstra 1995; Riechert 1999). The significance of spider assemblages for biological control of pests in Australia or Egypt or / and different location an agro-ecosystems is largely unknown, and spiders have been the subject of very few investigations (Bishop 1978, 1980; Bishop and Blood 1981).

The present study aims to survey the spiders associated with different pests infesting date palm trees in Beni-Suif and Qalubia Governorates during the period of October 2013 to October 2014.

## MATERIALS AND METHODS

### Mean number of progeny:

In order to study the mean number of progeny of *T. granarium* on different grains, 50 adults were introduced in one pound glass jar containing 100gm. Of a certain varieties of grains making 10 replicates for each variety.

After 12 days, the adults were removed and the grains were kept under the experiment condition. After another 6 weeks, the number of the offspring emerged was determined and this number was taken as an indication for progeny.

### Mean number of developmental period:

To study the life cycle of *T. granarium*, 50 adults (2 days old) were introduced in one pound glass jar containing 100 gm of the certain grain variety of grains for 24 hrs. Under the experimental conditions of temperature and relative humidity .After this period, the adults were removed and the infested grains were kept under the same conditions until the offspring started to emerge.

### Dobie index (DI):

The total number of emerged adults from each replicate was counted and the percentage of adult emergence was calculated in relation to the number of hatched eggs. The duration of developmental periods of the immature stages were taken as criteria for calculating the susceptibility by and Dobie (1974) .

## RESULTS

Results obtained are summarized in Table (1)and indicted that wheat variety of Giza 168 was the most tolerance and wheat variety of Ben-swaif 4 was the most susceptible .The Dobie index varied from 3.5 for Giza186 to 3.7 for Ben-swaif 4 in free choice method while the Dobie index varied from 2.6 for Giza186 to 3.3 for Ben-swaif 4 in non choice method .The variation in this index was due to the fluctuations in the percentage of emerged adults, since the developmental period did not vary largely. The percentage of emerged adults ranged between 35.8 for Giza186 and 123.2 for Ben-swaif 4 in free choice method but ranged between 64.6 for Giza186 and 107.2 for Ben-swaif 4 in non choice method.

Table1: susceptibility of six wheat varieties to infestation with the khapra beetle , *T. granarium*

Tested varieties	Free-choice				Non-choice			
	Eggs/ females	% of emerged adults	Periods of Development in days	Dobie index	Eggs/ females	% of emerged adults	Periods of development in days	Dobie index
Gamiza 7	92	84.8	57	3.4	108.33	92.4	64.2	2.9
Giza 168	48.75	35.8	63	3.5	80	64.6	58.0	2.6*
Sakha 93	70.25	54.8	56.2	3.4	110.33	78.2	59.6	3.2
Sohag 3	79.75	67.2	57	3.0	101.33	96.2	62.4	3.1
Seds 12	90.75	79.4	58.4	3.4	87	79.2	58.2	3.1
Ben-swaif 4	132	123.2	52.6	3.7	116	107.2	64.6	3.3**

\*The most tolerant variety.

\*\*The most susceptible variety.

## DISCUSSION

The susceptibility of certain Egyptian varieties of wheat to infestation with *T. granarium* adults and larvae as well as the biological aspects of the two stars of *T. granarium* when bred on the test varieties were studied. Choice and non-choice tests were carried out to determine the varietal susceptibility of *T. granarium* under constant laboratory conditions.

All tested wheat varieties had varying degrees of susceptibility to infestation with *Trogoderma granarium*. Beni-swaif4 wheat variety was the most susceptible variety to *Trogoderma granarium* infestation whereas Giza 168 was the least susceptible. The susceptible variety was also the most susceptible for egg laying and accordingly this was the most suitable for the rate of reproduction, as indicated by the number of offspring which emerged from the different varieties. Furthermore, the whole developmental periods of the insects were shortest on the most preferred variety than on the others.

Certain biological parameters were used as indicators of the preference infestation percentage, number of emerged adults, weight loss, mean developmental periods, and Dobie index.

Results of free-choice and non-choice experiments pointed to that Giza168 variety was less susceptible to *T. Trogoderma granarium* infestation meanwhile Beni-swaif4 showed most successful as a diet for rearing this insect and was preferred under free-choice or non-choice methods.

Respectively grain damage in remaining varieties. The varieties had varying degrees of damage by *Trogoderma granarium* larvae. The attack of grains may be ascribed to the nutritive content, soft kernel coat, and kernel size. (Enobakhare and law-Ogbomo, 2002).

These results are in agreement with those of (Youssef, 2004), who studied the susceptibility of wheat and maize varieties on *Sitophilus zeamais* and *Sitotroga cerealella* and found that, the percentage of infestation or the number of emerged offspring varied according to the variety.

High tolerance in cereal grains to storage insects has been due to low adult progeny, prolonged development period and low weight loss of grains (Michael *et al* 2000 and Shafique and Ahmed 2003).

These results confirmed the results obtained by Michael *et al.*(2000) who proved that high tolerance in cereal grains to stored insects has been due to low adult progeny prolonged development period and low weight loss of grains. Also, feeding by *Trogoderma granarium* larvae reduces the weight of grains in a very short storage period. High number of adult progeny caused high weight loss of grains susceptibility of the insects (Ranson *et al.*, 1992)

So, Beni-swaif4 variety was highly susceptible to the test insect (adult or larvae) on the basis of high number of adult progeny with high grain weight loss. Contrary to that Giza168 variety was found highly tolerant to insect in both free-choice or non-choice methods. On the basis of low progeny with low weight loss. Feeding by *Trogoderma granarium* larvae reduces the weight of kernels in a very short storage period.

Resistance in grains to storage insects has been assessed on the basis of different parameters such as insect low oviposition preference on grains egg hatch, insect progeny, development and weight loss of grains (Michael *et al.*, 2000).

These results are in agreement with those of Hala *et al.* (2005) they studied the susceptibility of wheat varieties and found that, the percentage of infestation or the

number or emerged offspring varied according to the variety.

Resistance in stored grains depends on multiple factors such as insect species, varieties and their physiochemical factors such as hardness of kernels in wheat and gluten in wheat (Michael *et al.*, 2000).

These results confirmed the results obtained by (Michael *et al.*, 2000) and (Muhammad and chaudry, 2007) which proved that high tolerance in cereals grains to storage insects has been due to low adult progeny, prolonged development period. Also supported by the finding of Riyad (2009) who reported that maximum developmental period days was recorded in Raj-3765, while minimum developmental period in Raj-3077.

Sajid *et al.* (2011). recorded the relative food preference (free choice) and developmental period of *Tribolium castanum*, *Rhizopertha dominica* and *T. granarium* on paddy, brown and milled rice under laboratory conditions.

Hussain and Nasr (2015). showed that the susceptibility of some wheat varieties to *S. oryza* and *R.dominica* had a significant differences between the growth indexes of various wheat varieties.

Similarly, Paudel *et al.* (2003). obtained difference in infestation in various varieties of maize caused by *T. granarium* which is somewhat in accordance with the present findings Further, Aheer and Ahmed (1993), Jakhar *et al.* (2006), Sayed *et al.* (2006) and Riyad (2009) also reported significant variation in grain damage in different varieties due to *T. granarium*, support the present findings.

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## RABIC SUMMERY

### حساسية ست اصناف من القمح للاصابة بحشرة خنفساء الصعيد

نعيمة عبد الروؤف عبد الرازق<sup>1</sup> - محمد عادل حسين توفيق<sup>1</sup> - سناء محمود محجوب<sup>2</sup> - دعاء محمود محمد غريب<sup>2</sup>

1 - قسم علم الحشرات جامعة عين شمس

2 - معهد بحوث وقاية النباتات - مركز البحوث الزراعية

تم دراسة افضلية التغذية النسبية بطريقة الاختبار الحر والاختبار الاجبارى على ست اصناف من القمح وتشمل جميذة 7- جميذة 168- سخا 93- سواهج 3- سدس 12- بنى سويف 4 ضد خنفساء الصعيد وعلاقتها بمتوسط عدد خروج الجيل ومتوسط فترة النمو والحساسية النسبية.

وقد اظهرت النتائج ان نسبة خروج الجيل كانت اكثر حساسية فى الصنفين بنى سويف 4 و جميذة 7 لحشرة *Trogoderma granarium*.

وهذان الصنفان هما المفضلان بالنسبة للحشرة فى طريقة الاختبار الحر بينما الصنفين بنى سويف 4 وسواهج 3 هما المفضلان فى التجربة الاختيارية بينما جميذة 168 و سخا 93 هما الاقل افضلية بالترتيب. متوسط فترة النمو فى التجربة الاجبارية سجلت ان الصنفين بنى سويف 4 و جميذة 7 هما اطول فترة نمو وقد وجد اختلاف فى فترات النمو بينما فى التجربة الاختيارية قد سجل الصنف بنى سويف 4 اقل فترة نمو وكانت 5206 يوم واطول فترة كانت للصنف جميذة 168 يوم. وقد اثبتت التجارب ان نسبة الحساسية مختلفة بين الاصناف وقد سجل الصنف بنى سويف 4 وهو الاكثر حساسية وسجل 3.3-3.7 فى التجريبتين والاختارتين بالترتيب.

ميكانيكية مقاومة الحشرة للحبوب معقدة وتعتمد على الخصائص الكيموفزيائية والبيوكيميائية للحبوب. والحساسية النسبية تشير الى كثرة حساسية الحشرة.

الصنف الاكثر حساسية هو بنى سويف 4 والاقل حساسية هو جميذة 168.